After an extended service life of 25-35 years, critical components of the stator become worn, leading to increased outages for service and repair. At this stage it is beneficial to replace the key components, the stator core and windings with a new support system using new components manufactured to latest design standards.

<table>
<thead>
<tr>
<th>Customer Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approximately 15-20% cheaper than a complete new generator stator</td>
</tr>
<tr>
<td>Maximum reuse of existing parts</td>
</tr>
<tr>
<td>No foundation changes necessary</td>
</tr>
<tr>
<td>Short installation time</td>
</tr>
<tr>
<td>Stator swap during a planned outage possible</td>
</tr>
</tbody>
</table>

The new midsection integrates the reused remaining parts and as well matches to the existing foundation.

Identified issues

The stator core and the stator windings, especially in older generators, often reach the end of their lifetime, due to:

- Loose stator core lamination
- Aged core sheet insulation with hot spots
- Worn high voltage insulation on stator windings
- High end winding vibration with fretting traces
- High partial discharges in the stator windings with discharge traces
- Hydrogen or water leaks inside the stator winding cooling circuit

Solution

Alstom offers a cost effective solution by replacing the midsection of the stator. The replaced stator matches all existing interfaces thus minimizing outage time whilst offering an upgrade in power output to match possible turbine upgrades.

All active parts and components with wear are from the newest materials and Alstom state-of-the-art design, such as:

- Stator frame middle section
- Flexible core suspension to the new frame
- Stator core with new lamination sheets, press plates and tension bolts
- Winding, end winding support and slot wedges
- Adapted cooling system suitable for the existing and reused rotor
Product Description

A new stator midsection, matching the remaining parts and foundations, will be built in an Alstom factory using state of the art material and Alstom technology. The old generator remains operational until the new midsection is manufactured, tested and delivered to site.

During a planned outage, the old stator will be removed, the reused parts will be refurbished and the new stator installed.

Additional benefits

- Increase in generator efficiency
- Power output increase possible
- Reduction of future service activities
- Extension of the stator life by 25-35 years

References

The S&R generator package stator midsection was developed from proven Alstom technology for large hydrogen/water cooled generators up to 1000 MW power output. All of the existing electrical and mechanical generator components are calculated using modern computer programs to optimize vibration, cooling and loss behaviour. Several case studies and performed services show a possible power output increase by 10-20%.

Upgrades

<table>
<thead>
<tr>
<th>Location</th>
<th>Country</th>
<th>Old Power</th>
<th>New Power</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEELE</td>
<td>US</td>
<td>490 MVA</td>
<td>540 MVA</td>
<td>+10 %</td>
</tr>
<tr>
<td>ALMARAZ</td>
<td>ES</td>
<td>1034 MVA</td>
<td>1180 MVA</td>
<td>+14 %</td>
</tr>
<tr>
<td>FORSMARK</td>
<td>SE</td>
<td>1300 MVA</td>
<td>1545 MVA</td>
<td>+18 %</td>
</tr>
</tbody>
</table>

Your local service partner: